AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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The AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and new ideas in the field of agriculture, particularly as they are related to advancements through research. Material appearing herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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IN THIS ISSUE

Safety Is a Resposibility 2
Tranquilizers May Improve Meat Production 3
Parasite Control Improves Cattle on Irrigated Pastures 5
Tax System Must Encourage Production 5
Herbicides Eliminate Labor, Cut Operating Costs 6
Hagley Museum Shows Birth of U. S. Economic Independence 7
Rigid Laboratory Tests Assure Safety of Food and Agricultural Chemicals 8
New Products and Applications 10
Soil Fumigant Keeps Mother Earth Friendly.... 12
New Methionine Product Now Offered by Du Pont 14
Investment in Machines Increases Farm Size 15
Greasy Spot Yields to Zineb Fungicide 16
Control of Flies Helps Increase Dairy Profits 16
Chemicals Take Depression Years Out of Tomato Production 17
Farmers Ask About 19

Safety Is a Responsibility

Making farm chemicals effective is only half the challenge facing the chemical industry in the rapidly growing field of food and farm chemicals. Making chemicals safe is the other half. Insecticides, fungicides and the other chemicals -- like many of mankind's most useful tools -- have certain hazards connected with their use and especially their misuse. Providing safeguards against such hazards is a matter of prime concern to the chemical industry.

Two forces guide the manufacturer in the production and distribution of safe chemical products. One is the set of rules established by law. The Federal Government, all of the states, and many municipalities have legal requirements as to safety and provide sanctions against those whose activity threatens public health. In the main, these laws have been well administered and effective. Yet, in the end, the force of law is usually a negative one. It can control obvious abuse and punish wrong-doers. But high standards cannot be guaranteed by law alone. Police action can deal with outlaws, but provides no positive incentive to establish safer methods and to discover better products.

Business Integrity

The affirmative force must be the character of the business firm itself: its concern for its good name, its tradition of integrity, and the high technical qualifications of its personnel and facilities. Like the individual citizen, the business firm does not fulfill its responsibility to the community merely by conforming to the dictates of the law. Instead it recognizes ethical standards beyond the law. Du Pont strives not merely to fulfill the legal requirements but also to maintain its good name as a company in which safety is the first consideration, and public responsibility an ethical imperative to be followed at all cost.

How important safety is to industry is illustrated by the fact that one of Du Pont's biggest single research investments in the development of agricultural chemicals is in the facilities and procedures needed to determine hazards and establish safety standards. The work that goes into such a determination is given in detail in the study on page 8 of this issue.

Tranquilizers May Improve Meat Production

The calming effect of tranquilizers on the animal organism has touched off a number of studies on the use of these drugs to increase the efficiency of livestock production. This is reminiscent of soothing music in the dairy barn. The possibility is being explored that tranquilizers may reduce animal activity or excitement, thus concentrating a greater share of metabolism toward weight gain and production.

Such application of tranquilizers has a parallel in low levels of antibiotics or anthelmintics in the feed as a means of maintaining the animal at a higher level of efficiency than would be obtained under normal husbandry conditions. Although there is conflicting evidence, some studies indicate that the theory is sound, but extensive further work must be done before conclusive results are available. In addition, final evaluation must await a study of the long-range effect of tranquilizers on breeding, quality of meat, and other factors.

Damon Catron of the Iowa State College has "estimated that losses from stress must be somewhere around 25 to 30 per cent of our total livestock production . . . . some put it higher." He defined stress before the annual meeting of the Animal Health Institute as "any adverse physiological condition which prevents the animal from reaching his maximum genetic potentiality." Some of the stress factors particularly to be watched are: overeating, injuries, poor sanitation, chilling, overcrowding, small and large animals together, scouring, castration, cold floors, and dampness. These items include both physiological and "psychological" factors. Although prevention is the principal goal in avoiding stress, he pointed out, it is not always possible and alleviating measures must be taken for best results.

Much Information Available

Much of the experimental work with tranquilizers must be done with laboratory animals and a considerable body of information on their effect on the animal organism is being accumulated. Tranquilizers, for example, have found useful application in veterinary medicine. Unfriendly dogs become more friendly and shy dogs less shy following treatment with these drugs (1).

Tranquilizers have been successfully used in connection with the administration of anesthetics in animal surgery. In one report, based on work with over 100 dogs, chlorpromazine facilitated administration of anesthetics and greatly improved the recovery of animals from anesthesia (2). Bronchial reflex irritability was reduced to such an extent that induction of the anesthetic was invariably smooth, "in marked contrast to the stormy induction associated with the pre-anesthetic use of morphine."

Aid to Anesthesia

Furthermore, the tranquilizer made possible 20 to 60 per cent reduction in the anesthetic dosage, without reduction in the effective period of anesthesia. Post-operatively, the tranquilizer made emergence from anesthesia quiet, even when ether was used. Vomiting occurred in no animals, either pre or post-operatively when the drug was administered. With chlorpromazine, all animals "passed from anesthesia into a light sleep lasting up to four hours, from which they could be easily roused." The drug proved effective in calming small animals in a state of irritability due to pain, injury, or strange surroundings, thus facilitating therapy.

The potential problems involved in tranquilizer administration are apparent in other experiments. At the University of Chicago, meprobamate blocked imprinting among ducks -- the instinctive process that leads baby ducks to follow their mother shortly after hatching. The process of imprinting is common among a number of animal species and disturbance of the function may have serious consequences in the process of learning to live.

Experiments at the New York Psychiatric Institute have shown that prolonged dosage of chlorpromazine has a long-range depressive effect on monkeys. In the earlier stages of administration of the drug, the animal recovers rapidly from his state of torpor, but after 18 months, recovery is considerably more difficult.

Psychologic Factors In Growth

An interesting study which may shed some light on the effect of the animal psyche on growth was made at the Wistar Institute of Anatomy and Physiology (3). A group of white albino rats regularly petted and handled by experimenters showed the following results:

1. Significantly greater mean weight compared to controls.
2. More activity and less fearful behavior in the open field situation.
3. Less damage sustained by the endocrine, cardiovascular, and gastrointestinal system under prolonged emotional stress.

Work now in progress may well answer the question as to whether administration of tranquilizers may not achieve the same results, not only in the laboratory, but in practical application to the raising of meat animals and the production of milk and eggs.

1 Estrada, E.: "Clinical use of Chloropromazine in Veterinary Medicine", JOURNAL OF AMERICAN VETERINARY MEDICINE ASSOCIATION, vol. 128, pp. 292-294, 1956.

2 Graves, John H.: "Chlorpromazine As A Preanesthetic and Tranquilizing Agent In Veterinary Medicine", VETERINARY MEDICINE, vol. 52, pp. 185-187, 1957.

3 Weininger, Otto: "Physiological Damage Under Emotional Stress As A Function Of Early Experience", SCIENCE, vol. 119, 285-286, February, 1954.

Parasite Control Improves Cattle on Irrigated Pastures

The University of Nevada (1) studied the effect of various parasite control programs with phenothiazine in the weight gain of moderately infected Hereford cows and their calves. Seventy-four cows with 32 calves were divided into three groups on separate, irrigated pastures and treated with phenothiazine as follows:

Group I — Control

Group II—Therapeutic followed by low-level

Group III — Therapeutic

The scope of the parasite infection, before treatment, ranged from 300 to 600 eggs per gram of feces from composite group samples. Groups I and III had free access to stock salt and Group II was provided with 10 per cent phenothiazine salt. The results of the 79-days' test are summarized in the Table.

Summary and Conclusions:

1. The cows in Group II (Therapeutic and Low-level) gained 43 lbs. more than Group I (Control) and 56 lbs. more than Group III (Therapeutic).

2. Presumably the initial parasitic infection in the calves was light because of their ages. Therefore the primary reasons for the superior gains of the calves in the two treated groups (II and III) was that the treatment of the cows resulted in less exposure of the calves to parasites on the pasture.

3. Group II, cows and calves, which received low-level phenothiazine in a 10 per cent phenothiazine-salt mixture, consumed an average of 1.4 grams of phenothiazine per head per day. Though the differential intake was not measured between cows and calves, it was apparent that the cows ate considerably more phenothiazine than the 1.4 gram average and the calves ate considerably less.

Initial weights and average gain of cows and calves under various parasite control programs using phenothiazine

Group Number:	I	II	III
Phenothiazine Treatment:	None	Therapeutic* & Low Level	Therapeutic*
Data on Cows			
No. Head	21	26	27
Av. Initial Wt., lbs.	889.0	880.0	926.0
Av. Total Gain, lbs.	92.0	135.0	78.6
Av. Daily Gain, lbs.	1.16	1.71	1.00
Data on Calves			
No. Head	10	12	10
Av. Initial Wt., lbs.	175.5	167.5	151.0
Av. Total Gain, lbs.	125.0	147.5	154.5
Av. Daily Gain, lbs.	1.58	1.87	1.96

* *Therapeutic Phenothiazine Treatments - 60 grams to cows using "Vetrothiazine" and 25 grams to calves administered as a drench.*

1 *Unpublished data from a test conducted by J. F. Kidwell and J. E. Hunter, Department of Animal Husbandry, University of Nevada in cooperation with representatives of the Du Pont Company.*

MORE PLANTS to lighten the tax burden

TAX SYSTEM MUST ENCOURAGE PRODUCTION

Since all taxes represent a slice of the product of the nation's farms and factories, the best hope of lightening that tax burden is to encourage investment in growth and expansion. If tax revisions can stimulate expanded production, while increases in government services are kept at the lowest possible level, a smaller part of total production will go into taxes. This is the program recommended in a new 32-page booklet, entitled "The Story of Taxes," published by the Du Pont Company.

Government at all levels now takes over $100 billion in taxes, about 25 per cent of the total output of the farms, factories, and businesses in the nation. Whether the nation's tax burden is crushing and tolerable depends on its economic strength -- its ability to produce enough goods to pay the cost of government without seriously depleting the living standards of the people. Until comparatively recently, most government revenue came from the land. In the agrarian economy of 1800, 40 per cent of the national income came from agricultural production, compared to five per cent today. The industrial changes since then have brought a spectacular rise in the nation's productive might.

Application of Business Principles

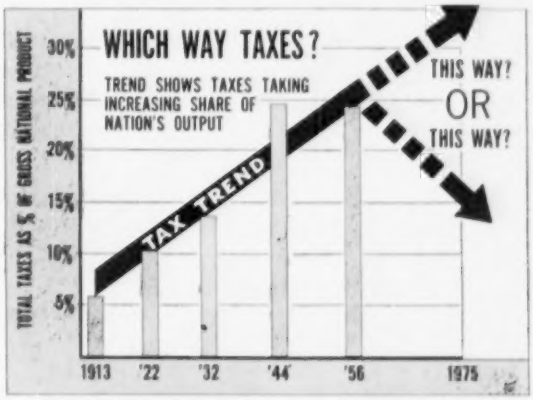
In approaching tax problems, the booklet points out, "the objective should be to keep costs as low as is commensurate with national need and, at the same time, expand the economy which carries them." Basically this means applying to taxation the principle of volume production at lowest unit cost which has made the U. S. productive system so effective.

The principal hope for cutting the tax load lies, therefore, "in increasing the efficiency of farm and factory, in expanding the modern industrial units" which enable men "to make each hour more productive." It is vital, therefore, that the structure of the tax system must encourage -- or at least not penalize -- industrial growth and expansion. The funds for expansion, both for industry and agriculture, would be depleted by "punitive or confiscatory taxes on the premise that business should pay 'all the traffic will bear.' "

Tax Would Penalize Growth

An example of a dangerously punitive tax is the proposed graduated levy on corporations which "would penalize new investment and erect a solid barrier to future progress." A discriminatory tax of this type would strike hardest at the incentive for growth, not only by curtailing the share of funds available for new investment, but by causing a precipitous decline in the rate of return when new investments are made. Farmers already understand the effect of tax graduation on their operations. An increase in profits resulting from investment in new machinery, more land, or other productive improvements often takes his personal income into a higher surtax bracket, thus steadily whittling down each additional dollar of income from new investment.

As a concrete example of its recommended tax reduction method, the booklet points out that a tax load that takes one fourth of our $410 billion output would represent but one sixth if output were raised to $650 billion. Such a rise is expected by 1970, if present growth rates continue, and the national product by 1975 may reach $750 billion.



LARGER SHARE of Nation's output has been going into Federal, state, and local taxes. Future tax burden depends on ability of U. S. economy to produce enough goods to pay government costs without reducing living standards.

Herbicides Eliminate Labor, Cut Operating Costs

The farmer, the businessman, and even the scientist are finding in chemical weed-killers a new and substantial cost-cutter. With labor scarce and wages at record levels, chemical weed-killers brighten the profit prospects of many farmers and businessmen.* For the farmer, new chemicals provide efficient and economical means of eliminating such back-breaking tasks as weeding.

A survey of cotton plantation owners recorded a hand-hoeing cost up to $40 per acre. Shifting to pre-emergence use of "Karmex" DL weed killer proved effective in controlling such plants as crabgrass, pigweed, purslane, cockleburr, lambsquarters, and water grass. Up to four hoeings were eliminated with the chemicals -- sometimes no hand hoeing was needed at all -- and the cost of weeding was cut to an average of $12.50 or less per acre.

Eliminates Two Hoeings

On Cedarway Farm near Calhoun Falls, S. C., 149 acres of cotton were treated with "Karmex" in 1956, at a cost saving of $1,371. S. F. Sherard, Jr., who operated the farm with his father, stated, "The cotton rows were kept free of grass and weeds at a cost of $2.60 per acre. This eliminates two hoeings which would have cost $5.00 per acre each."

With chemicals "I can cut my hoeing bill to less than half," according to Paul R. Whitaker, who raises about 200 acres of cotton at Wetumpka, Ala. After three years of "Karmex" application, he points out that "chemical weed control in an average year for cotton is just as important as machinery .... In a year, they would be three times as valuable because I probably couldn't get in the fields to plow."

B. S. Sherrill of Cornelius, N. C., states that "Karmex" has "given excellent control of both weeds and grass in my cotton and it has saved me a considerable amount of money in chopping and weeding costs, allowing cotton to get off to a good start" on his 40 acres.

Some of the most significant figures on cost savings come as a result of industrial applications. Shell Oil Company, for example, spent $650 a mile for mechanical clearing of mixed brush five to 15 feet high from 22 miles of its right of way in a remote section of Oklahoma. Chemical clearance -- with an 85 per cent kill after the first treatment -- cut the cost to $130 over a five-year period. In a similar situation, the Rockland Light and Power Company cleared a right of way in a thickly-wooded area of the Catskills at a cost of $230,000 every six years. Chemical treatment would require initial cost of $191,000, with retreatment in six years estimated at $93,600.

The Corps of Engineers has used "Ammate"X weed and brush killer for control of willow trees on the river banks of flood control projects. The trees not only reduced capacity of the streams but often fell in, creating snags. Chopping, piling and burning cost $450 per stream mile, but "Ammate"X cut the expense to $404 the first year, and $106 thereafter. The engineer at one military post found that chemical soil sterilant cleared vegetations from a designated area with 12 man-hours of labor, compared to 240 man-hours with mechanical means.

Application Lasts Entire Season

The New Jersey Turnpike Authority used "Telvar" to clear shoulders, safety lanes, and other areas, with one application lasting all season. The saving in labor is indicated by the fact that three men and one truck cleared the entire 160 miles (about 100 acres) in two weeks with only 3000 pounds of chemical.

Control of undesirable vegetation -- although but one phase of chemical operations -- illustrates clearly the savings in time and labor resulting from agricultural chemicals. Their development through industrial research has been a major factor in the rise of farm productivity in recent years. Along with farm machinery, chemicals have revolutionized agriculture in the United States and some manual or mechanical operations commonplace even today will soon be museum-pieces along with the flail, the winnow and the scythe.

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* *Archeologists have discovered that "Telvar" weed killer prevents weed regrowth around ruins being excavated, saving time, cost and inconvenience.*

HAGLEY MUSEUM Shows Birth of U.S. Economic Independence

The mills that converted the bounty of early American fields and forests into food, clothing and other necessities to sustain and support the nation's newly won independence are portrayed in the Hagley Museum, recently opened on the Brandywine River, near Wilmington, Delaware.

The Brandywine, at the height of its industrial development in the late 18th and early 19th centuries, powered many different mills and typified the industrial efforts which were in time to give the young nation's economy self-sufficiency to secure its political independence.

Old Mills Preserved

The Hagley Musuem building, a converted 1814 textile mill, is located on the site of early Du Pont powder mills along the Brandywine. Twenty special exhibits show the enterprises that were processing the farmers' grain, fibers and trees to fill the growing country's critical needs. In addition, some of the old mills still stand on the 165 acres of beautifully landscaped grounds which surround the museum building.

The Brandywine shore played a vital part creating economic stability and industrial output. During the first three decades of U. S. existence, as many as 100 mills turned out flour, textiles, metal products, and other needed goods. When the wheat belt was located along the eastern seaboard, Brandywine mills ground 500 million bushels of wheat per year into flour that became famous in all parts of the world.

Here, too, Du Pont for 119 years made the explosives that helped clear the land, lay the roads, build the mines, and defend the country. Eleuthere Irenee du Pont, an immigrant from France, was one of the Brandywine industrialists who helped develop and advance a new technology which led to the unparalleled economic advances made since then. Much of the modern machinery that tills the soil and produces factory goods can trace its ancestry to the early water-driven mills along American streams.

System Provides Incentive

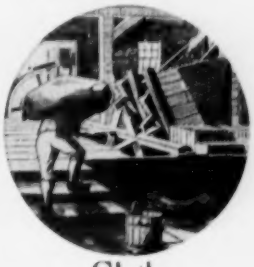
The rapid growth of industry along the Brandywine underlines the opportunity for development provided by the American political and economic systems. Men have the chance to rise through their own abilities and to retain enough of the fruits of their own labors or ideas to make them want to do their best.

For behind the advancement of technology is the brain in the heads of men. Unless men with the knowledge and intelligence have the opportunity and incentive to experiment and build, there can no progress. In many societies a man is limited to his station for life, and if he discovers a way of making anything new, it is taken away from him by the state.

The Museum is operated by the Eleutherian Mills-Hagley Foundation, an educational foundation, endowed by the Du Pont Company. It is open to the public without charge every day, except Monday.

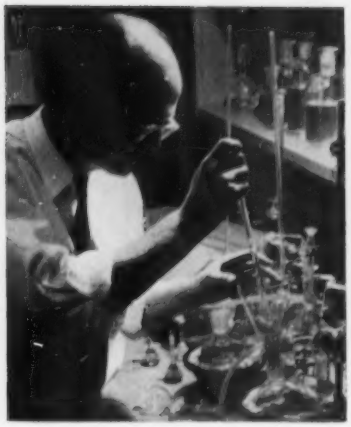
Paper

Lumber



Cloth

Flour



FUNGICIDE RESIDUE on tomatoes is checked. In use, residue is often only one per cent of level found safe in laboratory tests by DuPont scientists.

LETHAL DOSE is determined as first step in extensive laboratory tests to find safe tolerances for new chemical considered for agricultural use.

FEEDING TESTS of two weeks, 90 days, and two years, show long-range effects and check rate of elimination or storage of chemicals in the body.

Rigid Laboratory Tests Assure Safety of Food and Agricultural Chemicals

With $260 million worth of pesticides, plus many tons of food additives used each year to help grow, process, and improve the nation's food supply, protecting the public health has become a major responsibility of the chemical industry. Elaborate research methods -- sometimes involving years of rigid testing -- have been developed to make certain that neither user nor consumer will be injured as a result of food and farm chemicals.

Safe Tolerances Set

On the basis of these studies, carefully spelled-out directions for use and safe residue tolerances are established. Maximum tolerances of chemicals in food products are set at the smallest concentration necessary in order to allow the greatest possible safety factor which is often as high as 100 to 1.

Illustrative of the care with which safety factors are determined by many chemical companies is the work done at Du Pont's Haskell Laboratory for Toxicology and Industrial Medicine on "Manzate" maneb fungicide. Over a period of four years and at a cost exceeding $100,000, exhaustive tests were made to establish the effects of the chemical when eaten or brought in contact with the skin. The directions for use were worked out so that concentration on sprayed vegetables would be well within safe limits.

Submitted for FDA Approval

The experimental results were submitted to the Food and Drug Administration and the Department of Agriculture for approval of tolerances. Under the law a company proposing to sell a new agricultural chemical must not only submit test results but must explain why the chemical is necessary and what it can do beyond products already on the market. Only when these facts were considered and the tolerances published in the Federal Register could "Manzate" be put on the market.

Check Food Additives

In the case of food additives, such as mold inhibitors or humectants, the law does not require advance approval by the Food and Drug Administration. Du Pont has, however, made it a practice to work out its testing procedure on such products with the FDA and to

SKIN TEST is part of research procedure, when indicated. Irritating effect of chemical on eyes may also be examined on volunteers or on animals.

INHALATION of chemical fumes or vapor shows potential danger to user and indicates protective measures that should be followed in practice.

BLOOD SAMPLE is taken from animal during tests. Effects on body functions, tissues, and fluids are studied by specialists at all stages of work.

submit the results for evaluation before selling additives. Naturally, products found to be harmful, whether or not submitted for approval, can be ordered withdrawn by FDA.

Precautions Stated

The data compiled in the Haskell study are made a part of the extensive evidence furnished to the USDA and FDA when a new product is submitted for registration or approval. The information is also the basis for the precautionary statements contained on the product label (in the case of pesticides the label, too, must be approved by the Department of Agriculture).

For example, the label on "Marlate" 50 methoxychlor insecticide carries this statement: "Do not apply to any crop within seven days of harvest. Remove residues remaining at harvest by washing, brushing, or other effective means." The result of these precautions was shown when alfalfa was sprayed with one pound of actual methoxychlor per acre in a typical test. A sample taken the same day showed a residue of 88 parts per million (well within the 100 ppm tolerance permitted for this crop). Within seven days, the residue level was down to 38 ppm.

Development Vital

Development of new chemical products is becoming increasingly a vital part to the nation's activity. Not only must new steps be taken to provide better means of protecting man's food supply from insects, fungi, and disease, but new products must be developed to replace natural products as the population continues its rapid advance.*

The steps taken by Du Pont and other chemical companies to protect the public health give assurance that these products can be used without hazard to the public health.

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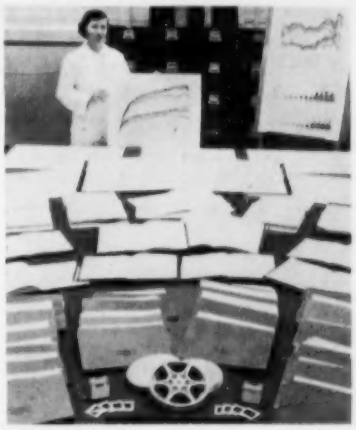
* *The natural increase of the United States population is now* 1.5 *percent per year. The total may reach* 193 *million people by* 1965.



RECORDS of safety tests on "MANZATE" include 4500 notebook pages, 3000 sheets of correspondence, movie film, slides, 50 graphs, and other data.

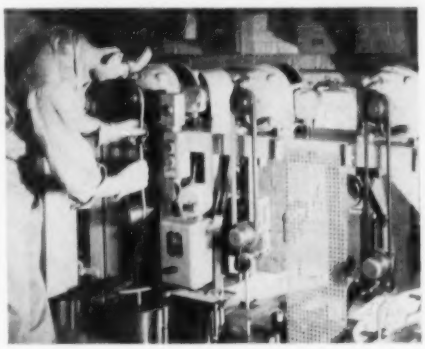
LABEL, based on experimental findings, spells out proper use of chemical product, includes safety precautions to assure safety of farm chemicals.

new PRODUCTS AND APPLICATIONS

An all-purpose cement made of neoprene synthetic rubber with wide use on farms is available in ¾ ounce tubes. The cement has long been used industrially by shoe and pocketbook manufacturers, glaziers, and cabinet makers. According to the manufacturer (Barge Cement Manufacturing Co., Towaco, N. J.), neoprene cement will bond any combination of rubber, leather, wood, cork, glass, metal plaster, paper, concrete, ceramics, celluloid, and plastics (except vinyl). It is recommended for sealing water and gasoline tanks.

* * * * *

V-belts reinforced with Du Pont "Dacron" polyester fiber provide advantages in both strength and size for fanbelts in farm machines and automobiles, as well as many industrial and machine applications. Strength of V-belts, as of automobile tires, depends on the strength provided by fiber cord embedded in the rubber material. "Dacron" reinforced belts will last longer, transmit more power, resist moisture, and perform better generally than the same size made with other types of cord.



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Tests under very severe winter weather conditions have proved the suitability of jackets lined with Du Pont nylon fleece for rugged outdoor wear. Tests were made by workers atop Mount Washington, where, winds of 100 miles per hour are common and winter temperatures often drop to 30 or 40 degrees below zero. Average weight of test jackets was only a little more than half as much as the commercially available outer garments generally worn in such climates. Sample jackets were made by McGregor-Doniger, Inc.

* * * * *

A shock absorber made of Du Pont neoprene synthetic rubber provides additional security for tying down tarpaulins on trucks and other places where wind or weather impact can be a problem. The "spring" is a rod of neoprene about ¾ inch in diameter and 10 inches long, with an eye in each end. The tying line is threaded through and made fast to both eyes, leaving some slack in the line beween eyes. Thus the major shocks are absorbed by the strong elastic link. (Manufactured by Goodall Rubber Co., Trenton, N. J.).

* * * * *

Type 272 "Super Cordura" high tenacity yarn, the same tough fiber used in tire manufacture, is now available for lock stitching and seaming of shoes. No failure was experienced in an 18-month wear test of the cord under extremely rigorous conditions. This material is far less sensitive to moisture than previous yarns, making it highly suitable for shoes worn in inclement weather or on muddy terrain encountered in farming. Laboratory tests have also shown exceptional flex resistance.

Harmful sludging of engines can be stopped with a new detergent, Du Pont No. "7" motor oil additive. The additive is especially useful for farm equipment since sludging is most severe in short trips that do not allow motor oil to reach proper operating temperature. One pint added to oil at each change reduces oil consumption, eliminates sludge and varnish formation, promotes free flow of oil through engine, maintains free ring and valve action, and reduces hydraulic valve and lifter noise.

A new and improved sealer for auto, truck, and tractor cooling systems is another addition to Du Pont's No. "7" automotive product line. The new product, which stops leaks faster than the majority of available sealers and can withstand the high pressures of modern engines, produces an effective seal in less than three-fifths of a second. It has superior resistance to corrosion and is suitable for use with all three major coolants - water, and glycol and methanol antifreeze solutions.

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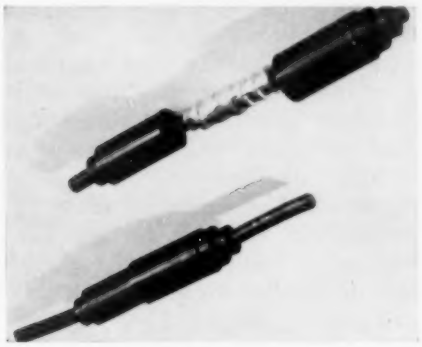

Moisture-proof splices in farm or home electrical wiring can now be made simply with molded covers of "Alathon" polyethylene resin. It consists of two tubular sections which slide together end-to-end to form an overlapping seal. It can be assembled in 15 seconds, less than a fourth of the time needed for proper wrapping with friction tape. The finished splice is symmetrical, making it ideal for use where appearance is important. The cover can easily be separated and reused. (Made by Plastic Engineering and Sales Corp., Fort Worth, Tex.).

* * * * *

A small bore gun that is built, handles and looks like a big game rifle is now manufactured by Remington Arms Company, Inc. Designated as Model 552 "Speedmaster," the autoloading 22 caliber rifle is based on the know-how attained after over one-half century of experience in the making of autoloading firearms. The new rifle fits into the "matched set" of autoloaders which Remington has been introducing over the past few years. Its magazine capacity is 15 long rifle, 17 long, or 20 short cartridges.

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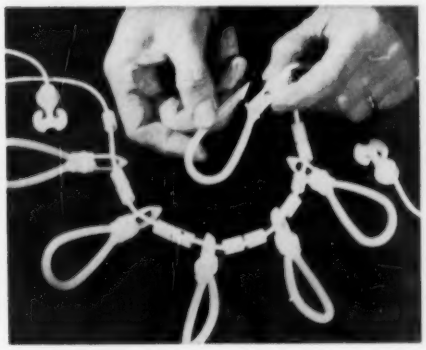


A fish stringer that will not rot or rust is now made of tough, lightweight nylon. Each stringer is equipped with six clips molded in a single piece of Du Pont "Zytel" nylon resin. Each clip flexes without danger of breaking. By raising a small collar, a point may be freed for hooking fish through both lips (fish hooked through the lower lip only cannot breathe but will die). A molded tab of "Zytel" attached to each end of the cord can be used to fasten the stringer to boat, dock or belt. (Manufactured by the Lewis E. Hammel Co., Rochester, N. Y.).

* * * * *

Wider markets for cheese and baked goods are expected from recent improvements by Du Pont in "Mycoban" sodium or calcium propionate mold and rope inhibitor. Used for many years in the bakery industry, the product has now been approved by the Food and Drug Administration as a mold retardant in slices and cut wedges of pasteurized cheese. Improvements have made "Mycoban" free of foreign odor, non-caking, and have given it finer texture, better uniformity, and increased density.

Soil Fumigant Keeps Mother Earth Friendly

R. P. HOLDSWORTH, JR., PH. D.
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Mother Earth is pictured as a friendly place for plants to flourish—but all too often soils teem with fungi, weed seeds, microscopic worms called nematodes, and other hostile organisms which attack the seed itself, injure root systems, or compete for soil moisture and fertility.

For centuries, a farmer's only recourse against soil pests was to give up planting the affected crop in the infested field—either temporarily or perhaps permanently. This led to various plans for crop rotation, and even caused abandonment of some crops in certain areas. The golden nematode, for example, has been disastrous to potato production on Long Island and in some parts of Europe. Crops in which rotation is used to control serious diseases include small grains, corn, alfalfa, red clover, sweet potatoes, beans, potatoes, tomatoes, cucumbers, egg plant, onion, cotton, tobacco, and sugar beets.

It is often difficult to maintain economic efficiency where fields must be rotated simply for disease control. Furthermore, the practice is not always successful, because many weed species are hosts to pests, maintaining the infestation during the "off" years.

Small-Scale Use

Nurserymen and greenhouse operators have long used steam or chemical disinfectants to treat the relatively small amounts of soil which they use over and over. Only within the last few decades has soil treatment appeared practical for large areas.

Plant-beds—such as those used for starting tobacco, tomatoes, ornamental shrubs, and other transplants—are particularly susceptible to soil pests. These areas may be used year after year, giving weed seeds, fungi, and other organisms a chance to build up. Weeds are especially serious. Germinating about the same time as the crop seed, they steal moisture and fertility, especially nitrogen, in the early stages of the seedlings' growth—when it needs all-out resources to get a healthy start. Seed is generally sown so thick that hand weeding is impossible or prohibitively expensive, so soil treatment is a welcome alternative.

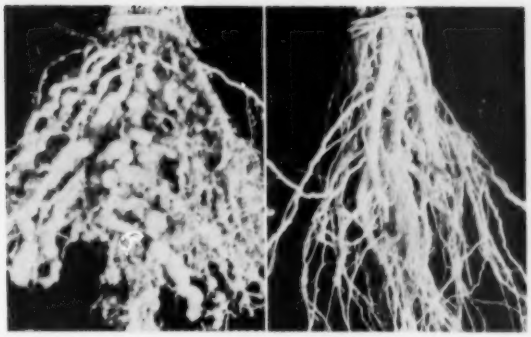
Many tobacco farmers, especially, do not have enough good soil for the long rotations required to control root diseases. They need a safe and efficient soil treatment permitting shorter rotations. Early experiments with chloropicrin, urea, and formaldehyde demonstrated that some tobacco diseases could be controlled by adding chemicals to the soil. But they were either expensive and cumbersome to apply adversely affected growth and quality.

Mixing the chemical with the soil can be costly and tedious, so development of penetrating volatile disinfectants has been a significant advance.

VPM Introduced

Soil pests are now targets of another chemical, VPM soil fumigant, first offered by Du Pont in the spring of 1956. Applied to moist soil, it forms vapors which kill or suppress many types of undesirable organisms, including weed seedlings, certain soil insects, fungi, and nematodes. "Damping-off" or seedling blight, common in plant-beds and caused by fungi, is also controlled with this product. VPM is based on sodium methyldithiocarbamate.

Kentucky tobacco plant-beds are among the first commercial production areas to be treated with this new chemical. It is also recommended for weed control in tobacco plant-beds in Virginia, where it has been under test for two years at Blacksburg, Chatham, and Glade Spring experimental stations. It has given "generally good" control of all weeds except clover in the plant-beds.



Vapam soil fumigant made the difference in these plant roots. The knotty roots, at the left, are infected with nematodes, while healthy roots, right, were treated with VPM.

Experimental results on tobacco "black shank," a wilt disease carried in the soil which can spread rapidly through tobacco fields, have been good, but the cost of field-scale applications, in contrast to the relatively small area of plant-bed, has thus far made the practice impractical under normal conditions.

For plant-beds, the major advantage of VPM is that the effective vapor can be sealed in the soil with water alone, eliminating the expensive and cumbersome gas-proof tarpaulin. It can be applied in the fall, so that fumigation does not upset the spring seedling schedule, which is critical for producing good plants for transplanting. The principles of propagating nursery plants for transplanting are similar to plant-bed production of seedlings for farm fields. Weed control in a wholesale nursery can be expensive, running as much as $100 per week for labor during the late spring and summer.

Fumigating Flowers

Fumigation may also help Florida growers produce quality cut flowers. The sandy soil peculiar to the central and southern peninsula harbors "damping-off" and wilt-type fungi, as well as nematodes which attack the roots of plants. Also, the longevity of snapdragons and calendulas, for example, far exceeds the period for which many fumigants are effective. Planted in beds during October and November, they are harvested in good quality and quantity until the middle of March, but could potentially produce fine blooms well into May. In some soils, flowers of the "Dianthus" family, such as garden pinks and carnations, are doomed to certain failure because of wilt-type fungi. A third hazard in Florida flower growing is the host of broad-leaved weeds and grasses which have to be hoed or pulled by hand. It appears that a worthwhile degree of weed and nematode control can be obtained for five months or more with VPM. Control of soil fungi may last at least three months, depending on the amount of reinfestation which occurs.

Test-plot trial with VPM indicate that use of the fumigant on tomatoes for transplanting (where the problems are similar to those of plant-beds or tobacco and ornamentals) produces significantly larger plants. Similar treatment also substantially increased yields in cucumber plots.

Increased Potato Yield

In the light sandy soils of the Pacific Northwest, "early maturity disease," caused by a soil-borne fungus, makes potato plants yellow and die in mid-August; fumigation with VPM promises effective control. Yield has been increased four times with fumigation, which is also highly effective against pigweed, lambsquarters, and several grasses. The same fungus, incidentally, causes a devastating strawberry disease.

VPM is recommended only as a pre-planting treatment within limitations and directions specified. The effective vapors which are formed in moist soil must be properly distributed and contained for an adequate period of time, then finally dissipated to permit growth of desirable plants.

For surface treatment, VPM is mixed with water and supplied with a sprinkling can, hose proportioner, power sprayer, or overhead sprinkler. Wetting after appliation seals the chemical in the soil. It may also be placed at the proper depth by being sprayed on the plow sole or injected with standard fumigation equipment. With most soils, the area does not have to be covered after treatment.

New Methionine Product Now Offered by Du Pont

A second source of methionine activity for broiler and turkey mash is now offered by the Du Pont Company. The new product is called Du Pont "methionine hydroxy analogue calcium", and is chemically related to DL-methionine which has been supplied by the company for several years. In the nutrition of chickens and turkeys, either product used in the proper amount will supply the methionine requirements. The selection of one product over the other depends largely on the feed manufacturer's preference and the formula in which it will be used. Technical assistance in fitting either product into feed formulas is available.

The new product is a grayish white, granular material of relatively high density, in contrast to the fluffy, cream-colored and slightly waxy powder of DL-methionine. The analogue is available in 100-pound drums while DL-methionine is sold in 50-pound drums.

The value of methionine supplementation in high-energy rations for meat birds has been demonstrated by Du Pont research with both broilers and turkeys. In 1955, nutritionists of Stine Laboratory reported a direct relationship between the methionine requirement and the energy content of the diet. They theorized at that time that such a relationship probably existed for other animals and other nutrients, and this was later confirmed with another amino acid, lysine, in experiments with rats. A recent report carried the concept to methionine in the diet of turkey poults.

As the calorie level is increased within the range commonly found in commercial rations, the methionine requirement increases at about the same rate for both chickens and poults.

The practical value of this research and the commercial value of methionine products come from the modern trend toward higher energy rations for poultry feeding, so birds can be raised to market weight on less total feed. Methionine is one critical nutrient which is most likely to become deficient as calorie content is increased, and the Du Pont studies provide a means of calculating the extent to which a given ration must be supplemented with methionine. Sources of energy and protein are still the most expensive portion of most rations, so a proper balance between the two can provide maximum feed efficiency at minimum cost.

DU PONT MANUAL ON TURFGRASS FERTILIZATION

A manual on latest turfgrass fertilization techniques -- covering everything from seed propagation to sample budgets -- has been issued by the Du Pont Polychemicals Department, manufacturer of "Uramite" fertilizer compound.

The manual, "Turfgrass Fertilization: Its Theory and Practice", was written in consultation with two outstanding agronomists, H. B. Musser, of Pennsylvania State University, and W. H. Daniel, of Purdue University.

Purpose of the manual is to help professional growers build a turfgrass fertilization program that produces the best results when combined with other turf management practices.

Professional growers may obtain copies of the turfgrass manual by contacting, or writing to, their local distributors for "Uramite" fertilizer compound.

CONTROL OF SOIL-INHABITING FUNGI

Vapors of some fungicides effective against soil-inhabiting fungi are highly toxic to specific species of Rhizoctonia, Botrytis, Fusarium, and Thielaviaopsis, experiments at the Connecticut Experiment Station show.

Patrick M. Miller and Ernest M. Stoddard found in laboratory tests that "Ceresan M" seed disinfectant and o-nitrochlorobenzene (25 per cent active) where highly effective in a volatile state against all the fungi tested. Pentachloronitrobenzine (75 per cent active) was moderately effective against Botrytis cinerea and Rhizoctonia solani, but not against Fusarium or Thielvia basicola. All fungicides tested which are commonly used as soil fungicides act to some extent in a volatile state.

In these Connecticut tests, fungicides were kept from direct contact with the fungi. Only those materials which had vapors found toxic to R. Solani in the laboratory were also toxic to it in soil and prevented its killing of zinnia seedlings.

Investment in Machines Increases Farm Size

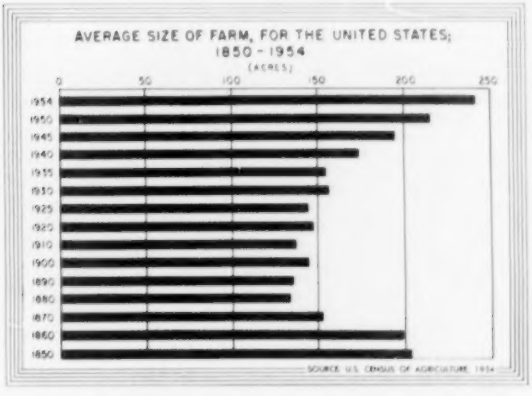
Growth in agricultural technology has brought with it a steady increase in the size and production of U. S. farms, just as technological advances have increased the size and output of manufacturing industries. The rise in the average farm size began in 1880, but the greatest relative growth has been in recent years, when the rate of mechanization in farming has attained new high levels.

The average farm reached 242.2 acres by the 1954 agricultural census, more than any time in the past century. Since 1910, 104 acres have been added to the average (75 per cent increase), more than two-thirds of it since 1935. The period of greatest change was between the 1950 and 1954 censuses, when the average jumped 26.9 acres (12.5 per cent).

Investment Determines Size

As in the case of U. S. industrial growth, the principal factor affecting the size of the average farm unit is the nature of the modern productive process. The basic purpose is basically the same: to produce the maximum quantity of goods at the least cost. What the increased productivity of machines has given the nation is reflected in the fact that the average American is better fed, better housed, better clothed than would have been dreamed possible a century ago.

Whereas farms were once limited in size by the number of family members or hired hands available for work, the minimum size is often fixed today by the investment in machinery needed to carry on an efficient competitive operation. Development of improved machines and agricultural chemicals has accelerated the shift to larger farms. Today, about 80 per cent of wheel tractors sold for farm use have belt horse-power rating of 30 or more, compared to 25 per cent in 1947. As pointed out by the Department of Agriculture, "farmers are adding additional acreage to their farms so that they can use larger equipment economically. Expanded use of larger power equipment and custom machines can be expected to continue for some years."



Steady increase in farm size is shown by census figures. High average in middle 1800's was partly due to plantation system, large farms in western territories, and untillable land.

Machinery Use Increased

The rise in the farm investment needed for effective operation is indicated by the fact that the number of farm tractors and trucks has almost tripled since 1940. An even more rapid increase has taken place in several other equipment lines. For example, in 1945 there were 2.7 grain combines used per 1000 acres of crops harvested, while the 1954 census showed 6.7. In addition, cultivation of land and production of livestock now requires substantial investments in fertilizers, feeds and chemicals, as well as machinery.

A similar pattern is apparent in industry where larger, better machinery has greatly increased investment per employee. The average investment in "tools" used for manufacturing is over $12,000 for each job created. The nation's 100 largest non-financial companies have a per-employee investment of over $16,000. In the chemical industry, mechanization has progressed more rapidly than in several other fields and average investment is about $24,000. The Du Pont Company's average operating investment per employee is over $25,000, as compared to only $11,100 in 1940.

These facts -- both in the case of industry and agriculture -- underline a basic rule of economics: the size of a productive unit is governed by the job it is engaged in performing. Where operations require higher investment, size must adjust to make the necessary resources available.

Greasy Spot Yields To Zineb Fungicide

Zineb (ethylene bisdithiocarbamate) Fungicide is now recommended for control of greasy spot and fruit russeting on oranges and grapefruit, on the basis of experiments at the Lake Alfred Experimental Station, University of Florida. The researches have indicated that either or both of these organisms may cause russeting of the skin. Greasy spot also affects leaves and causes them to drop prematurely. Rust mite, too, causes excessive leaf drop.

Originally, it was believed that greasy spot was caused by the rust mite (Phyllocoptruta oleivora Ash), but the casual agent was later identified as a fungus (Mycosphaerella horrii Hara). Another fungus organism causing russet of fruit may also be involved.

Copper fungicides have been used some since 1953 to control greasy spot. This treatment tends to scar and blacken citrus with a blemish known as "star melanose," as a result of which it could not be put on the fresh-fruit market. During 1955, experiments with several different dithiocarbamate fungicides were begun. Results showed zineb provides a substatial measure of control. Du Pont makes zineb fungicide under the trademark "Parzate."

A residue tolerance of seven parts per million has been set for citrus fruit. Residue analyses have demonstrated that this tolerance can be readily met in commercial practice when directions as to proper use are followed.

METHOXYCHLOR CONTROLS CURCULIO

Studies at the Waltham Field Station, University of Massachusetts, have "developed methoxychlor into the number one insecticide to control heavy infestations of the plum curculio and have shown that it is compatible with the common fungicides and miticides." Tests were carried on at the Waltham orchard which is used entirely for pest control. Early in the Station's work, the orchard was found to have an extremely high infestation by the plum curculio, "often suffering 85 to 95 per cent stung fruit on trees unprotected by an adequate insecticide. Consequently, the insect work has emphasized the evaluation of materials and spray schedules for curculio control."

Control of Flies Helps Increase Dairy Profits

A net profit increase of as much as $10 per dairy cow has been realized in a six-week period from proper control of biting flies, according to studies made over the past two years by the New Jersey Agricultural Experiment Station. Spraying with Du Pont "Marlate" 50 methoxychlor insecticide provided pest control so that cows could devote their energies to eating and milk production instead of fighting flies. Even where insect annoyance was not great, fly control brought about increased milk production which netted farmers $3.50 per cow over a six-week period.

Cows protected from flies gave 66 more pounds of milk during a 56-day test at the University of Arkansas. Animals sprayed with methoxychlor plus "Crag" Fly Repellent gave an average of 1,256 pounds of milk, while those sprayed with methoxychlor only gave 1,245 pounds. Unsprayed cows produced only 1,190 pounds. The calculated return on each cow treated with the mixture was $62.80, compared to $62.25 for methoxychlor, and $59.50 for untreated animals.

Experiments at the Mississippi Experiment Station at West Point revealed that "the number of horn flies was significantly less on the groups of animals sprayed with methoxychlor, "Crag" Fly Repellent and methoxychlor plus tabutrex than on the non-sprayed animals." The second treatment was the most efficient. Under the conditions of the experiment no influence was noted on milk flow, but according to the report of the study, "if a horn fly population had been present a definite influence on milk would have been expected."

BIO-ASSAY REVEALS SEED TREATMENT

A bio-assay which indicates the presence of mercury is a quick method of establishing whether or not a lot of seed has been treated. Samples of the grain are seeded on plates which have been innoculated with any organism, bacteria, or fungus. The plates are incubated for 24 to 48 hours. A clear zone around the seed will indicate the presence of mercury. This method can also be used with known standards to measure the relative quantity of treatment on the grain.

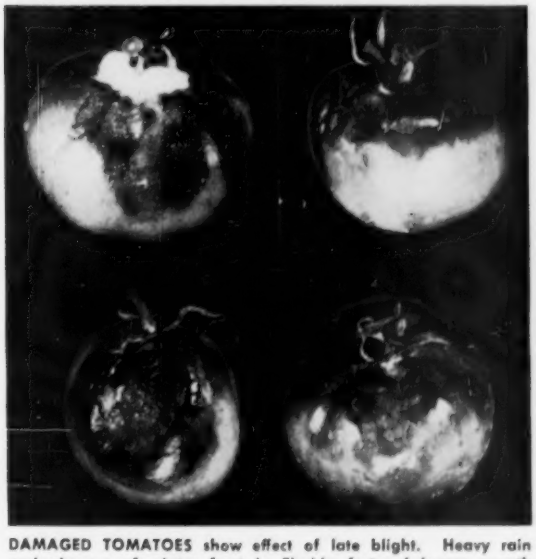
Chemicals Take Depression Years Out of Tomato Production

By JOSEPH A. EVANS, PH. D.
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co., Inc.

Greatest enemy of the nation's $275,000,000 tomato crop is a group of diseases which may cause damage from a few rotten fruits to entire fields wiped out. Reports from southern tomato areas indicate that 1957 may be as severe a year for late blight as 1946, when it was epidemic from the Gulf Coast up through the Mid-West and from Florida to Maine.

There are two categories of tomato production: For the fresh market and for processing. Fresh market tomatoes, about one third of the total acreage, are generally picked green or "pink" to withstand the handling of grading, packing, and shipping. Tomatoes for processing are often grown under contract to canning companies. Most of the acreage for processing is in the northern half of the United States.

Yields of tomatoes for fresh market are generally measured in bushels, and in Florida where 400 bushels may be a common yield, good growers aim for 600 to 700 bushels to the acre, and in some cases, as high as 1000. Tomatoes for canning are measured in tons, and protecting the crop takes on more significance with a 15-ton or 20-ton yield as a target than when ten tons represented a championship. The goals are now higher than ever, as growers seek to get the greatest possible production out of their vines in order to meet the challenge of increasing production costs. Climatic conditions in the South make tomato growing impossible without an extensive spray program, but for years northern tomato growers "got by" with little or no spraying until the 1946 epidemic.



DAMAGED TOMATOES show effect of late blight. Heavy rain and absence of winter frost in Florida fostered heavy growth of blight fungus and gray leaf spot during 1957 growing season.

Weather Favors Blight

In southern Florida this year, early tomato fields were deluged by heavy rains, and many fields were drowned out. There had been no winter frost in Florida to destroy the blight inoculum and the damp weather fostered rapid development of blight and gray leaf spot, which spread rapidly over unprotected tomato vines. In the Immokalee area, growers had up to 20 days of fog per month, with temperatures over 80 degrees -- ideal blight weather -- and 14 inches of rain fell in one two-week period. With top-yielding fields of stake-tomatoes promising to gross as much as $12,000 to $14,000 per acre, growers staged an all-out chemical spray program that could be tailored to meet the severe conditions, chemicals which could be applied to tender new leaves as often as every other day without risk of injury to the plant.

Southern Florida growers report that "Manzate" maneb fungicide saved crops when surrounding fields were lost to blight, or yields reduced by gray leaf spot. Growers who sprayed as often as 30 times during the 1957 season figured that their "Manzate" cost around $75 per acre. Cheaper chemicals often caused plant damage or inroads of disease which reduced yields 20 to 30 per cent. Many growers have reported that "Manzate" proved to be the only chemical which gave full protection without chemical injury to the vines.

Florida growing conditions in 1957 may represent the severest test any tomato spray program will have to meet anywhere for years to come. Where fields were saved from the floods,

REGULAR SCHEDULE of fungicide sprays protects world's largest tomato farm, B & L Farms, Homestead, Fla. The 7000 acres are largely coral, which is ground up by field machines and fertilized.

BOXING TOMATOES on mobile harvester at B & L Farms. Pickers feed tomatoes on 100 ft. conveyors which extend from each side. The machines move across field, keeping pace with pickers.

in areas around Ruskin, Immokalee, Homestead and Fort Pierce, thousands of acres produced chemically protected tomatoes which might otherwise have been lost to the blight which followed the deluge. Prolonged dry weather is one condition which may stop the march of blight into northern canning tomato areas this summer, but the disease is always a hazard.

Contract Buyers Seek High Yields

Canning companies look for growers and fields with high potential production, and then urge growers to aim for the top -- not just the average. For example, the state average in New Jersey in 1956, an excellent tomato year, was 12.6 tons compared with a 10-year average (1945-1954) of 7.4 tons. But each year the New Jersey 10-tonners number in the hundreds.

While per acre production costs may be lower in the North than in the South, it costs a grower $100 an acre, or more, to get a tomato crop into the ground and bring it up to the time pest control is needed. Meanwhile, when the grower signs up with a canning company, the company is actually committing itself to an investment of about $2,000 per acre to assure a market for that farmer's crop. It is a serious mistake to tie up land, labor, and capital in a good potential with inadequate pest control protection during the season.

Leading growers in New Jersey found that fields with five or more fungicide applications in 1956 yielded half again as many tomatoes as fields with only one fungicide application. And that was in an exceptionally good tomato year when bumper crops seemed to come naturally to everyone. In midwestern areas, tomatoes to fields on a regular crop protection schedule for five years or more have averaged yield increases up to 75 percent per acre or better over the pre-protection era.

Professional Sprayers Used

The cost of spray equipment and the variety of chemicals now available are putting spraying on a professional basis,with more farmers in northern areas employing custom sprayers. It is estimated in New Jersey and in the Mid-West that one ton of tomatoes will pay the acre cost of a typical custom spray contract for the entire season. Costs for six typical applications run around $33 per acre for complete disease and insect protection.

Few farmers can afford to risk the financial disaster that a bad blight year can bring, or even the reduced yields and grade that result from infestations of anthracnose, gray leaf spot, and Septoria leaf spot. These diseases thrive on the same excesses of temperature and moisture that make good tomato years. Thus, when yields promise to be the greatest, diseases may make their most serious threat.

A protection program for pest control pays greater dividends than any other single farm operation in efficient tomato production.

Radio Waves Make Seed Germinate

High frequency waves have been used by scientists at the Washington State College to "crack" seeds that will not germinate normally. Germination of hard alfalfa seed has been increased from 60 to 96 per cent by exposure to high frequency energy for 25 seconds.

Farmers Ask About . . . .

Q: What is "silo-fillers disease?"

A: Inhalation of nitrogen dioxide which may form in fresh silage, causing a disease characterized by severe caughing and burning or chocking pains in throat and chest. Serious illness, even death, may result in the absence of prompt medical care.

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Q: How much poultry is used in food processing?

A: In 1956, food processing and canning used almost 200 million pounds (ready-to-cook weight) of poultry.

* * * * * *

Q: Is immunity to genital vibriosis built up in cattle?

A: Yes. It is usually well developed by the time an initial infection has run its course (about six months). In cases that abort, the causative organism (Vibrio fetus) has usually disappeared within ten days after abortion.

* * * * * *

Q: How important is leptospirosis as an animal disease?

A: It is now the third most important cattle disease in the country, according to some estimates, and is widespread among hogs.

* * * * * *

Q: How much money is spent for food in the U. S.?

A: According to the latest USDA figures, the annual rate is about $71 billion.

* * * * * *

Q: Can artificial light be used exclusively for plant growth?

A: Experiments with fluorescent lights at the Ohio State University show that African violets and some other plants grow successfully with only artificial light. Because they provide optimum light levels over any period, more desirable plants can be grown under flourescent lamps than in greenhouses.

* * * * * *

Q: Why is sulfur necessary for arable soil?

A: Plants cannot grow in sulfur-deficient soil because this element is essential in the photosynthetic process.

Q: What feeding and drinking space should be provided for growing chicks?

A: Feeder space for the first two weeks should be 100 linear inches per hundred birds; from three to six weeks, 175 inches; and from seven to twelve weeks, 300 inches. Drinking space for the first two weeks should be 20 inches or two 1-gallon fountains; and from three to twelve weeks, 40 inches or two 3-gallon fountains.

* * * * * *

Q: What is "bridge-grafting?"

A: A type of grafting used to "bridge" a portion of the tree where the bark is damaged. Wood is grafted into the tree below and above the injured area.

* * * * * *

Q: Can you give some idea of the number of insects, such as the corn borer, which infest plants?

A: It has been estimated that Delaware, the nation's second smallest state, is supporting five billion corn borers, almost 30 times the entire U. S. population.

* * * * * *

Q: How do cattle grubs enter the animal?

A: The larvae of heel flies usually enter near the heel of cattle and then burrow upwards through the flesh. Cattle grubs cause an estimated loss of $100 to $200 million each year by damage to hides and flesh.

* * * * * *

Q: Has the 1908 meat-consumption record been surpassed?

A: In 1956, per capita meat consumption stood at 163.5 pounds, compared to the 1908 record of 162.5 pounds.

* * * * * *

Q: Does dehydration destroy the carotene in raisins, grapes, figs, or other fruits?

A: Properly controlled, artificial heat dehydration causes little loss, but sun drying is highly destructive.

* * * * * *

Q: How many farms have telephones?

A: About 52 per cent of the U. S. total have some kind of telephone service. Last year's increase was 3 per cent, the largest since 1947.

IN YOUR OWN COMMUNITY there may be two or three men like this one. He's a commercial or custom seed-treater, equipped with both the machines and the experience to treat seed with modern chemicals such as the new Du Pont "Ceresan" liquid seed disinfectants.

If you grow grain

This man can help step up your efficiency and keep your production costs down

He's a seed treater . . . and few people offer a service to farmers that is worth so much for so little cost. His service and the chemicals he uses protect the natural vigor of your seed, promote efficient growth, and help insure the quality of your harvest . . . all for pennies an acre.

Du Pont has been a supplier of his for many years. In that time many advances have been made in the quality of your seed and also in the chemicals that have been made available to help you produce better crops more efficiently.

One of the latest advancements is in the seed disinfectants bearing the familiar name "Ceresan." The new "Ceresan" formulations are liquids. They do a better job of protecting small grain and cotton seed against disease by killing spores on the seed itself, and protecting the seed and seedling in the ground. New "Ceresan" liquids also put a uniform red color on treated seed for easy identification.

These new products assure your local seed treater that he can give you service that is worth more than ever before.

"Ceresan" is a registered trademark of Du Pont

E. I. du Pont de Nemours & Co. (Inc.)

GRASSELLI CHEMICALS DEPARTMENT

Wilmington 98, Delaware

DU PONT

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY